

Out of the Hothouse

Design Consultancies and Computer Aided Design

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- 1 Bruce M, Morris B. (1994)
- 2 Rust C et al (1993)

out of the hothouse

Industrial designers have traditionally worked in a relatively simple, craft environment. It is possible to be a design consultant with little more than a drawing board and a telephone in the spare bedroom. Bruce and Morris¹, have concluded that low entry cost, coupled with lack of regulation, contribute to a fragmented, small scale consultancy industry. They also point to an unwillingness to invest in developing the business. Our own research indicates that most design consultancies are only prepared to invest in relatively low cost technology.

For a number of reasons, including the growing use of information technology, the focus of industrial design activity may be moving away from the "creative hothouse" of the consultancy and into the more constrained, but perhaps more productive environment of the manufacturing company. This may be masked by a continuing presentation of consultancy as the mainstream of design practice and the relative modesty of in-house designers.

As a result of increasing focus on information technology, as well as other organisational issues, much more design may be carried out in-house in future. Those independent design organisations which survive will need to have a much clearer sense of purpose, including an understanding of their relationship with clients, the role of technology in their practice and the nature of their "ownership" of a design project.

background - IT research at Sheffield Hallam University

For the past four years we have been looking at the implications of information technology for the practice of industrial design. This is an increasingly well trodden path but the impression we have is that research often focuses on potential or future issues. We have tried to build up a detailed view of, and insights into, current practice and immediate implications for designers.

We started our research with a programme of visits and interviews which helped us to form views of what might be happening in an organisational sense. We carried out a survey of designers and manufacturers in order to test some of the ideas which we had formed. We hosted a conference of designers and academics to explore the outcomes. In the resulting report², we made a number of suggestions about the future of the industrial design profession, particularly in relation to the location and role of professional designers.

The research has continued with a series of "hands-on" studies involving live commercial design projects and we hope to have something to say, in the near future, about the reality of using 3D computer techniques in commercial industrial design practice. This article, however, is concerned with the organisational implications of our research.

IT Infrastructure and the Designer

By comparison with industrial design consultancies, manufacturing organisations are prepared to invest in sophisticated IT resources, and do so on a large scale. In our survey we found that 62 per cent of CAD investment by the manufacturing companies was in heavy duty workstation systems, by contrast only 7 per cent of design consultancies at that time had comparable technology. Many manufacturers invest in such systems on a basis of one per desk for large numbers of design staff and showed a clear commitment to using CAD as the core medium for design, mainly in 2D but increasingly in 3D.

This is not just a question of virtuous manufacturers and backward design consultancies. The state of the art in IT lends itself to the practice of engineering far more easily than it does to industrial design. The case for investment in a manufacturing company with a large engineering team and a steady supply of development work is much more supportable than for a small design consultancy, unable to see clearly beyond the next invoice.

design consultancies and CAD? design

There might not be a problem if computer modelling were an optional extra for designers, but we found that there was a clear trend towards the use of this technique by manufacturers. Of those who did not use 3D CAD, 56 per cent had plans to do so. One of the driving forces behind this change is the need to shorten product development times. There is a widespread perception that techniques such as rapid prototyping and computer aided engineering analysis will be instrumental in this. Since these techniques rely on the existence of 3D computer models, designers who can participate directly in the creation and development of such models could have a substantial advantage in securing work with such companies. We have some evidence that this is starting to happen, for example in the case of a consultancy given a long-term retainer from a manufacturing client on the basis of their willingness to invest in specific CAD modelling resources which would complement and enhance the manufacturer's own facilities.

That is not the full story, since compatibility of 3D computer systems is an intractable problem for most businesses. In theory there are standards which ensure that models and drawings produced with one system may be transferred to another. In practice this is not straightforward and a very large proportion (77 per cent) of manufacturers who used 3D CAD felt it

important that designers used computer systems which were **directly compatible** with their own.

We are aware of six different kinds of modelling software in use by companies who employ industrial designers and there are no doubt others. Unlike the 2-dimensional worlds of graphic design (dominated by Postscript) or technical drafting (widely standardised on the Autocad file format), 3D CAD is at a stage of development where any standard way of describing models will be out of date rapidly. It is therefore very difficult for a consultancy to identify the software and hardware which will be most appropriate to their relationships with future clients.

Now it seems very dangerous to argue that the practice of design should be directed by technology, which is clearly secondary to the core skills and values of the profession. However, designers who wish to work with the most powerful computer tools are more likely to find that opportunity within a manufacturing company than in a consultancy. Manufacturing companies are increasingly attracted to information technology as an aid to rapid product development and issues of technical compatibility will favour in-house designers in competition with external consultancies.

summary of participants in survey - Information Technology in Industrial Design

Survey carried out during the period January-March 1992

Questionnaires (200 to each group) were sent to four groups:

Individual Designers

All product design members of the Chartered Society of Designers in 1991.
62 responses (31 per cent).

Design Consultancies

Listed in the Design Council Directory 1990 or Telecom Business Pages 1991.
50 responses (25 per cent) - Normally Partner or Director.

Manufacturers

Companies identified in Kompass as manufacturers of finished products under their own brand name.
41 responses (20 per cent) - Normally Design/Technical Director or Design Manager.

Sub-Contract Manufacturers

Companies in plastics moulding, precision die-casting or toolmaking, selected from Kompass as being of average size or larger for their industry and having an investment in CAD and/or CNC technology.
43 responses (21%) Normally Managing Director.

The full results of the survey and the analysis carried out are included in: *The Management of Information Technology in the Professional Practice of Industrial Design*, Sheffield Hallam University 1993.

design consultancies and CAD? design

reduced product development time

There is a widespread desire to speed up the process of product development and Trueman and Jobber³ find a clear linkage between innovation lead time and growth of sales. They also find that using information technology in the early, creative stages of a design is linked to an increase in company turnover, at least in part because it helps to reduce development time.

The arguments about speeding up the development process include the provision that more effort is needed in the early design stages to avoid problems later. This implies concurrent or multi-disciplinary design processes where the development team has a shared view and members avoid causing problems for each other through ill-informed decisions. James Fairhead⁴ describes the characteristics of members of the new product development team:

- a sense of ownership of the project
- freedom to take action on their own initiative
- a good understanding of the special skills of others on the team
- a willingness to cross over into the work of other specialists

appropriate location

In thinking about the need for continuous collaboration, one may fantasise about high speed data networks, video conferencing, virtual design studios and all the other ideas which suggest that physical location is going to be less important in future than it is today. Electronic communication can be a good alternative to driving around in cars but one of the companies we interviewed, *Crosrol*, a successful manufacturer of textile machinery, was a strong advocate for co-location of skills.

When asked about concurrent engineering they pointed to their success in implementing a concurrent design policy, largely through bringing together all design and manufacturing engineering staff on one floor of one office building. The company has a very flat management structure which allows individuals to take a great deal of responsibility for their design projects. The open-plan office is laid out with a number of small glass-walled meeting rooms where people can convene short semi-formal meetings.

It could be difficult for an external design consultancy,

in providing just one part of the total picture in one project, to function in such an environment. Would there be a need to have people on site during a project? How do you bill for time spent sitting in a meeting while three other people struggle to resolve a problem which is not yours but will have an effect on your work? Much of the effort in improving the product development process in industry today is focused on breaking down the artificial "walls" between traditional hierarchical departments. An external consultancy whose relationship with the manufacturer is at a senior level, and who may be both geographically and culturally remote from the manufacturing organisation could find this extremely challenging if not impossible.

bridging cultural divides

So there are compelling reasons why independent designers might find life more difficult in future. Moreover, the in-house designer will have special advantages and it is worth examining what benefits, other than access to the technology base, might come from working within a manufacturing company.

David Walker⁵ has suggested that designers and managers might be thought of as "Two Tribes at War". He goes on to describe the radically different thought processes of the two groups. They have different educations, different aspirations, they dress differently and often speak subtly different languages. If the other tribe lives across town and you only meet at ritually circumscribed events to discuss matters of considerable emotional value like money, "my design" and "my product", then it is not surprising if mutual suspicion and misunderstanding is the result.

The barrier between the two cultures might not be so significant when the other person is your neighbour and you spend a lot of time together resolving shared problems with the opportunity that gives for mutual respect. In a concurrent design project where the number of relationships is greatly multiplied and individuals cannot hide behind the skirts of the department head or consultancy principal, the need for trust and comprehension is even more vital. I believe that the designer who is an established member of the company team has a clear advantage.

Barry Waddilove, a designer who has worked in-house for Hotpoint, described how initial resistance was overcome, especially through his willingness to get involved in the same IT processes as his engineering colleagues. Having established a degree of mutual

consultancies and CAD? design consultancy

trust, the next stage was for him to start to carry his design work to a more advanced stage, refining detail with increasing confidence as he learned about the company's technical agenda. At the same time his engineering colleagues started to come to him for advice about their work. Often a simple cost reduction exercise took on a completely new dimension when an engineer recognised an opportunity to improve the appearance or human functions of a product - an unlikely event when industrial design was the responsibility of external consultants.

We talked to a number of such companies, including several brand leaders, who are developing the use of IT and working to accelerate product development. In each case, although they had often made no conscious strategic decision about the employment of industrial designers, they had shifted substantially or completely to in-house teams. This is coupled to changes in company structure which creates opportunities for in-house designers to extend themselves beyond their core roles. At Hotpoint the company allow individuals to become leaders of project teams outside their specialist area. Thus an industrial designer had the opportunity to lead a team introducing a new technique in manufacturing, greatly widening his experience and opportunities in the company.

In another company, who make specialist electronics equipment, there has been a shift at board level away from functional roles to Operations Directors responsible for product groups. Under this new structure, the company's industrial designer is seen as a strong candidate for management since he is recognised as a unifying force in the organisation, balancing the priorities of marketing, engineering and manufacturing.

In the past there have often been calls (by designers) for the appointment of designers as directors of companies. Calling for the wide appointment of Design Directors is probably as futile today as it has ever been and such directorships would only reinforce traditional departmental structures. But opportunities for designers to take a wide and leading role in manufacturing companies will arise if enough of them move alongside the engineers, accountants and marketers who provide the main professional base of an enterprise.

an independent option?

Not everybody wants to be Managing Director of a manufacturing company and it would be unwise to assume that in-house design teams will be capable of providing all the answers that a manufacturer might need. I believe that there is still a place for independent design houses and have previously proposed⁶ three models which might be adopted by a design consultancy business:

• strategic support

In this model a consultancy sets out to develop ways to enhance in-house design resources by focusing on longer term goals and creative direction. The proposition for the client would be the ability of the consultancy to refresh the "creative juices" of the in-house team and provide a strategic view of the marketplace and new technical opportunities. Information technology would have no special role. There are successful examples of this kind of highly creative design company today and they are usually characterised by charismatic leadership and an international reputation. This route might not involve spending big money on computers but it is not a realistic option for the majority of jobbing designers.

• special relationships

A design house could seek to develop long-term relationships with selected clients. These would be based in part on the need for much closer, continuing relationships to support concurrent development and also on the opportunity to invest in IT resources and links in partnership with clients. We have talked to a large manufacturer who has deliberately fostered a semi-formal "club" of other manufacturers and sub-contractors who use the same software. This is not the same as a software interest group since it is based on a clear wish to enable commercial links between the companies, for example by agreeing practices for data exchange between designers and toolmakers. They are extremely concerned that they build up a viable network of companies in order to ensure that their IT investment is effective and such a network might represent a real commercial opportunity for a design company looking to limit the risk of spending on IT.

An excellent example of a successful and durable special relationship is that between the Plas-Plugs company and Paul Hepworth as described by David Walker⁷. Paul Hepworth worked with Plasplugs as a external designer from the start of its programme

and CAD? design consultancies and

of diversification in DIY products and became a director of the company. The consistency of the product range and the success of the company bear witness to the value of this relationship, showing that it is possible for an independent designer to contribute to a sustained product development programme. But there are a number of factors which generate success in this case - such as, geographical proximity, commitment over a long period of time and the company's willingness to share the rewards. These factors might not be easy to reproduce, especially in an environment where industrial design consultancies are not evenly distributed around the country.

• one stop shop

The boldest strategy is for a design company to invest in the resources to take on complete product development projects. This could be an expensive proposition but there are a few examples of companies who are going down this road with some success. IT is at the core of this since it is the use of the full range of computer aided

engineering techniques which will make such an enterprise able to meet clients' targets for speed of development. Such an investment is also a demonstration to clients that the consultancy has substance and is prepared to make a serious commitment.

Oy Barker Design of Turku in Finland was formed by the amalgamation of two established consulting companies, one in industrial design and the other in engineering. This grouping was supported by investment in computer modelling, computer aided engineering and prototyping resources. Its success in handling complete product development projects demonstrates that a willingness to make a serious long term commitment can pay off. Very few UK design consultants have demonstrated anything like this willingness to invest in technical and human resources in support of long term goals.

An ambitious designer who would like to take advantage of these opportunities needs to have a realistic view of the edifice which they are constructing. Martin Vander Weyer⁸ describes how

three models for industrial design consultancy

	strategic support	special relationships	one-stop shop
proposition	A highly creative consultancy, able to refresh the creative juices of the in-house team and provide a longer-term, strategic view of the market place and new technical opportunities.	The consultancy as product development partner with strong developing relationships and complementary technology.	An organisation which can take on the entire burden of a new product development project and deliver a "turnkey" solution
IT implications	No particular implications	High degree of compatibility and sharing of data between consultant and client. Complementary resources, eg consultant's conceptual modelling and visualisation feeding into the client's Computer Aided Engineering (CAE) system.	Comprehensive range of CAE resources from conceptual modelling, through simulation to prototyping and manufacture.
staffing	Very creative. Able to interpret social/market/technical change into original product ideas and strategies.	Strong specialist strand but able to integrate well with the client's team and sustain the relationship. to provide a team approach.	Multi-disciplinary. Perhaps bringing together specialists in Marketing, Design, Engineering and Manufacturing
how do you sell it?	Mystique, Strong track record with brand names and exciting ideas, more mystique	Mutual confidence, complementary skills and resources, reliable partner.	Competence, breadth and depth, giving access to 'state of the art' technology, very rapid product development.
model	Seymour Powell?	May not exist today.	Oy Barker? IDEO?
comment	Not an option open to many but if you have talent, chutzpah and want to be a star...	This could be a route to follow for small consultancies who want to stay independent. Depends on your ability to form lasting relationships	May be the only way to grow without imploding when the walking capital hits the road. Focused on teams and technology.

This is not meant to be a vision of the future but it might provide a starting point for designers who want to think about how to be independent without being disposable.

design consultancies and CAD?

"people businesses" such as design consultancies are extremely difficult to control as they grow. The principal assets are "walking capital" and the more valuable they are the more likely it is that they will be tempted away as the company expands and their sense of "ownership" diminishes. A substantial investment in technology might help to offset the volatile nature of human capital but could bring yet more problems if the knowledge and skill to exploit the technology is focused on a few individuals who can walk away tomorrow. (Vander Weyer suggests that people businesses need to move away from the focus on leading "personalities" and develop a culture in which teams have ownership of and direct reward from their projects.)

in-house consultancies

Having set out to make a case for the employment of designers within manufacturing companies, it is necessary to point out that there are examples which negate most of the principal benefits. In a company with a traditional departmental structure there is a danger that the design "department" will function in almost exactly the same way as a consultancy organisation and will, in fact, see itself as such.

We have interviewed a former in-house designer at Philips who was employed in a project which set out with the laudable aim of involving industrial design from the very earliest stage. This was successful in terms of the quality of the result but very large costs were billed by the design department, since the designer spent a substantial amount of time in meetings and collaborative work. Because the internal charging system made the designer appear to be a very expensive resource, the result was counterproductive. It confirmed the engineers' view that industrial design was an expensive optional extra and later projects reverted to the practice of calling in the designers late, to apply cosmetic treatment.

a design industry?

When we started to look at the impact of IT on design we expected that we would learn something about computers and creativity. While we have learned a good deal about these issues and have been able to apply that knowledge to our teaching, it has become clear that there are also serious implications for the way in which design is organised and where it is carried out.

The rise of in-house design teams, in our view, is a largely hidden trend. In our 1993 research we found

that only 23 per cent of designers who responded to our survey worked in-house. It is difficult to gain a more informed up to date view without repeating the survey but, as an exercise we looked at industrial design jobs advertised in 9 recent issues of Design Week (chosen by the random technique of picking up every copy of the paper lying around our staff room) and found that there were exactly equal numbers of openings advertised by manufacturing and consultancy companies (11 in each). We also reviewed the "news" content of the same nine editions and found that industrial design activity by consultancies was mentioned 10 times and the work of in-house designers was mentioned once.

There is a common notion of an independent design "industry", and there are certainly sectors of design where specialist consultancies account for a lot of activity. Consultancy can seem a glamorous and exciting life, yet it could be argued that such designers are building houses for other people to live in, while they themselves must constantly move on, looking for another patron. I would like to suggest that the industrial design profession may only come to full maturity when the majority of practitioners are clearly integrated stable members of the manufacturing community. Then they might have the chance not only to help companies to build their houses, but also to continue to live in them, and so enjoy the longer term benefits of their work. Information technology may provide the catalyst for such a shift. How many of us relish that prospect is, of course, another question entirely Ω

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